

Chapter 1

Introduction to Pedestrian Facilities

1. Pedestrian Activity in New Jersey

All trips involve walking, irrespective of their primary mode. Many trips, especially those under 1.6 kilometers (1 mile) in length, are made solely on foot. Nationally, at least 8.5% of all trips are walking trips.

Between 2.5% and 6% of all *work* trips in the US are made via walking. In New Jersey, this share averages 4.1% and ranges from a high of 10.9% in Hudson County to a low of 0.2% in Passaic County (See Table 1).

County	Percent of Workers Walking to Work
Hudson	10.86
Atlantic	6.09
Mercer	5.86
Cape May	5.31
Essex	4.95
Burlington	3.97
Union	3.88
Warren	3.74
Bergen	3.46
Cumberland	3.41
Camden	3.19
Middlesex	3.16
Monmouth	3.01
Salem	2.78
Gloucester	2.58
Ocean	2.32
Hunterdon	2.29
Morris	2.22
Somerset	1.98
Sussex	1.78
Passaic	0.16

Source: 1990 Census

Table 1:

Pedestrian Work Trips in New Jersey

The 1990 Census shows that 156,500 New Jerseyans (4.1%) walk to work. After driving alone (71.6%), carpooling (12.4%) and using buses (5.4%), walking is the most frequent mode of commuting in New Jersey. Almost as many New Jerseyans walk to work as take the bus.

Despite the importance of the pedestrian travel mode, the expenditure spent on pedestrian facilities across the State is a very small fraction of that spent on other travel modes. Money that is spent for pedestrians tends to be utilitarian and minimal for the most part, aimed at merely accommodating pedestrian movement, rather than fostering it.

Walking to school accounts for at least one third of all pedestrian miles in the US. Providing adequate and safe facilities for such trips is therefore a very important component of planning for pedestrians.

Walking for shopping and business is a function of the land use pattern and can range from 3% for the typical suburban shopping center to as much as 90% for convenience stores in dense Suburban Activity Centers. Shopping averages 9% of all daily pedestrian trips.



Recreational walking and jogging is increasingly popular as public awareness of health and fitness expands. Social and recreational walking trips account for 12% of all pedestrian trips. Almost 90% of suburban area residents walk for exercise and recreation. Up to one-third do so at least five days per week and more than one-third also run or jog. The self-evident benefits of both recreational and functional walking in terms of health and energy savings are complemented by more subtle benefits that include increased neighborliness and a heightened awareness of the manmade and natural environment.

Data on pedestrian accidents shows that most accidents (around 60%) occur between 2:00 PM and 10:00 PM, peaking with the rush hour. Most susceptible to accidents are children, teenagers and the elderly. About one-third of the victims of both urban and rural accidents are children under 10 years of age; teenagers account for another 19% (urban) to 29% (rural); and the elderly (65 years plus) represent another 6% (rural) and 19% (urban) of accidents. The most common types of urban and rural pedestrian accidents - dart-outs, mid-block and intersection-dash - can all likely be reduced through proper design for pedestrians.

These Planning & Design Guidelines address the needs of pedestrians in all of the above settings and for all of these trip purposes. The Guidelines are concerned with defining appropriate facilities and design criteria to accommodate and foster pedestrian movement as well as to make it safer.

Since these guidelines are a companion document to NJDOT's Bicycle Compatible Roadways and Bikeways, it is appropriate to discuss the relationship between pedestrian and bicycle domains in general terms. While both functions need to be carefully planned for, the movement characteristics and needs of pedestrians and bicycles differ in obvious ways. The greater speed and size of the bicycle and rider means that, in general, bicycles are best accommodated as part of the roadway and not on sidewalks. Additional outside lane dimensions or widened shoulders perform this function most typically. For recreational pathways and other unique circumstances (e.g., certain bridges), pedestrian and bicycle movement is sometimes combined if adequate width can be provided and usage is not intense.

2. Goals and Visions for Pedestrian Use

The Intermodal Surface Transportation Efficiency Act (ISTEA) set a new direction for surface transportation in America that is enunciated in its statement of policy:

“to develop a National Intermodal Transportation System that is economically efficient, environmentally sound, provides the foundation for the Nation to compete in the global economy and will move people and goods in an energy efficient manner.”

Provisions for walking, with its potential for providing economically efficient transportation, became an important policy goal of ISTEA. The Secretary of Transportation was directed to conduct a national study that developed a plan for the increased use and enhanced safety of bicycling and walking. The National Bicycling and Walking Study - Transportation Choices for a Changing America presents a plan of action for activities at the Federal, State and local levels for meeting the following goals:

- To double the current percentage (from 7.9 percent to 15.8 percent) of total trips made by bicycling and walking; and
- To simultaneously reduce by 10 percent the number of bicyclists and pedestrians killed or injured in traffic crashes.

The potential for increasing the number of pedestrian trips is evident in the National Personal Transportation Survey, which shows that more than a quarter of all trips are 1.6 kilometers (one mile) or less, and 40 percent are 3.2 kilometers (two miles) or less. Almost half are 4.8 kilometers (three miles) or less and two-thirds are 8.0 kilometers (five miles) or less. Approximately 53 percent of all people live less than 3.2 kilometers (two miles) from the nearest public transportation route.



New Jersey residents have become aware of the energy, efficiency, health and economic benefits of walking for transportation and recreational purposes. In 1995, New Jersey Department of Transportation completed a statewide plan that established policies, goals and programmatic steps to promote safe and efficient walking for transportation and recreation in New Jersey. Through an extensive outreach effort, residents established a statewide vision for the future of bicycling and walking for all communities in New Jersey:

“New Jersey is a place where people choose to bicycle and walk. Residents and visitors are able to conveniently walk and bicycle with confidence and a sense of security in every community. Both activities are a routine part of transportation and recreation systems.”

In order to achieve this vision for New Jersey, it is necessary to plan and provide appropriate facilities that will accommodate, encourage and promote walking. This document provides direction regarding how appropriate facilities for pedestrians should be provided.

3. Pedestrian Characteristics and Level of Service

This section presents some basic definitions of concepts and characteristics of pedestrian movement, their relationship to various land use contexts and common pedestrian accident types. It is designed as a resource when planning for pedestrian movement.

Where pedestrian movement is very dense, such as on pedestrian bridges or tunnels, at intermodal connections, outside stadiums, or in the middle of downtown, then pedestrian capacity analysis may be needed. Research has developed a Level of Service concept for pedestrians that relates flow rate to spacing and walking speed. Table 2 presents some of these data. In most situations, however, this level of analysis is unnecessary and simpler standards can be applied.

Level of Service						
	A	B	C	D	E	F
Flow rate (ped./min./ft.)						
Walkways	<2	2-6.25	5.26-10	10-15	15-25	Variable
Stairs up	<5	5-7	7-10	10-13	13-17	Variable
Stairs down	<6	6-8	8-11	11-14	14-19	Variable
Spacing (sq. ft./ped.)						
Walkways	>130	40-130	24-40	15-24	6-15	<6
Stairs	>20	15-20	10-15	7-10	4-7	<4
Walking speed (ft./min.)						
Walkways	>260	250-260	240-250	225-240	150-225	<150
Stairs up	100	100	100	90-100	70-90	<70
Stairs down	120	120	120	100-120	75-100	<75

Source: *Highway Capacity Manual*, 1994.

Note: See Metric Conversion Tables in Appendix.

Table 2

Pedestrian Flow Characteristics on Walkways and Stairs



An average walking speed of 1.2 meters per second (four feet per second) has been used for many years. There is a growing tendency to use 1.1 meters per second (3.5 feet per second) as a general value and 0.9 or 1.0 meters per second (3.0 or 3.25 feet per second) for specific applications such as facilities used by the elderly or handicapped. Table 3 presents walk/trip characteristics by trip purpose based on a national sample. In assessing the probability of pedestrian trip making, these averages can serve as a helpful rule of thumb. Similarly, Figure 1 shows pedestrian trip generation rates for different land uses. Where roads abut such uses, either existing or proposed, these numbers provide an indication of potential trip making activity. The *Highway Capacity Manual* provides procedures for the operational analysis of walkways, crosswalks and street corners.

Specific accident classification types have been developed for pedestrian collisions. Accidents often occur because of deficient roadway designs or traffic control measures and/or due to improper behavior on the part of motorists and pedestrians. Examples of some of the more common types of pedestrian accidents and their likelihood of occurrence are shown in Figures 2 and 3.

Table 3
Walk Trip
Characteristics by
Purpose

	Daily pedestrian miles traveled in millions No. (%)	Average walk trip length (in miles)	Average trip time (in minutes)
To or From Work	0.18 (5.0%)	0.3	8.6
Work Related	0.23 (6.4%)	0.6	15.0
Shopping	0.33 (9.2%)	0.2	10.1
Other Family or Personal Business	0.19 (5.3%)	0.2	7.7
School/Church	1.15 (32%)	0.4	10.6
Doctor/Dentist	0.20 (5.6%)	0.6	19.4
Vacation	0.02 (0.5%)	0.7	19.8
Visit Friends or Relatives	0.12 (3.4%)	0.1	7.2
Other Social or Recreational	0.61 (17%)	0.5	11.8
Other	0.54 (15%)	0.5	12.5
TOTAL	3.57 (100%)		

Source: *National Personal Transportation Survey*, 1992.

Note: See Metric Conversion Tables in Appendix.



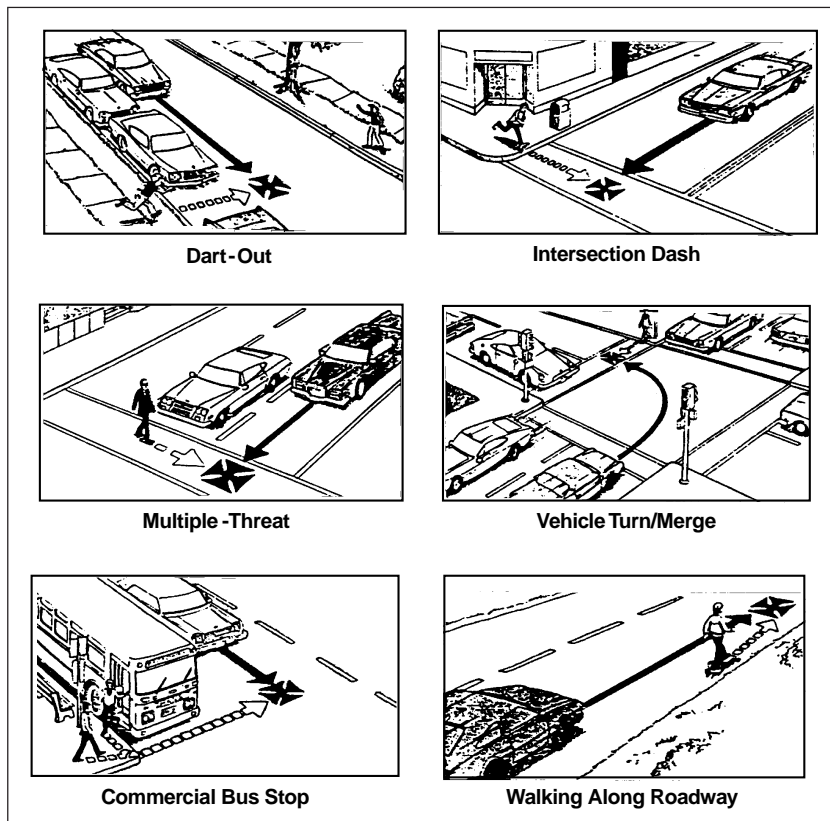
LAND USE TYPE	TRIP GENERATION RATES/PEDESTRIANS PER 1,000 SQ. FT.									
	5	10	15	20	25	30	35	40	45	
RETAILING										
SPECIALTY RETAILING										
NEIGHBORHOOD SHP. CTR.										
COMMUNITY SHP. CTR.										
NORMAL RETAILING										
REGIONAL SHOPPING CENTER										
FAST FOOD CARRY OUT										
FAST FOOD WITH SERVICE										
FULL SERVICE										
OFFICES										
LOCAL USE BUILDINGS										
HEADQUARTERS BUILDINGS										
MIXED USE BUILDINGS										
ALL OFFICE USES										
RESIDENTIAL										
SINGLE FAMILY DWELLING										
APARTMENT DWELLINGS										
HOTELS AND MOTELS										
PARKING										
METERED CURB										
UNMETERED CURB										
PARKING LOT										
PARKING GARAGE										

TRIP GENERATION IS A FUNCTION OF TYPE AND SIZE OF LAND USE

Source: A Pedestrian Planning Procedures Manual, FHWA, 1979.

Figure 1

Pedestrian Trip Generation Rates by Land Use Type



Source: Planning, Design and Maintenance of Pedestrian Facilities, FHWA, 1989

Figure 2

Common Types of Pedestrian Accidents



Figure 3

Pedestrian Accident
Types (Urban Areas)

DART-OUT (FIRST HALF) (24%)

Midblock (not at intersection)
Pedestrian sudden appearance and short time exposure (driver does not have time to react)
Pedestrian crossed less than halfway

DART-OUT (SECOND HALF) (10%)

Same as above except pedestrian gets at least halfway across before being struck

MIDBLOCK DASH (8%)

Midblock (not at intersection)
Pedestrian running but *not* sudden appearance or short time exposure as above

INTERSECTION DASH (13%)

Intersection
Same as dart-out (short time exposure or running) except it occurs at an intersection

VEHICLE TURN-MERGE WITH ATTENTION CONFLICT (4%)

Vehicle turning or merging into traffic
Driver is attending to traffic in one direction and hits pedestrian from a different direction

TURNING VEHICLE (5%)

Vehicle turning or merging into traffic
Driver attention *not* documented
Pedestrian *not* running

MULTIPLE THREAT (3%)

Pedestrian is hit as he steps into the next traffic lane by a vehicle moving in the same direction as vehicle(s) that stopped for the pedestrian
Collision vehicle driver's vision of pedestrian obstructed by the stopped vehicle

BUS STOP RELATED (2%)

Pedestrian steps out from in front of bus at a bus stop and is struck by vehicle moving in same direction as bus while passing bus

VENDOR-ICE CREAM TRUCK (2%)

Pedestrian struck while going to or from a vendor in a vehicle on the street

DISABLED VEHICLE RELATED (1%)

Pedestrian struck while working on or next to a disabled vehicle

RESULT OF VEHICLE-VEHICLE CRASH (3%)

Pedestrian hit by vehicle(s) as a result of a vehicle-vehicle collision

TRAPPED (1%)

Pedestrian hit when traffic light turned red (for pedestrian) and vehicles started moving

WALKING ALONG ROADWAY (1%)

Pedestrian struck while walking along the edge of the highway or on the shoulder

OTHER (23%)

Unusual circumstances, not countermeasure corrective

Source: [Florida Pedestrian Safety Plan](#), FDOT, 1992

4. Integrating Pedestrian Facilities into the Highway Planning Process

Guidelines on the design of a range of specific pedestrian facilities, including sidewalks, shoulders, medians, crosswalks, curb ramps, etc., are provided in Chapter Two. This section provides a policy context or criteria for the selection of appropriate facilities.

The selection of appropriate pedestrian facilities for different situations may be based on two factors:

- pedestrian facility problems or conditions that typically occur, and potential solutions related, for example, to cross section design, signalization, institutional or legal issues
- pedestrian safety factors and the potential enforcement/regulatory, engineering and physical countermeasures for these situations

Both site specific facility conditions and safety factors should be used and evaluated to select roadway improvements for pedestrians.

Table 4 presents a summary of pedestrian facility problems and potential solutions. Many of the concepts and design treatments presented in Chapter Two are addressed.

Figures 4 and 5 illustrate in matrix format the relationship between pedestrian accident types and their potential engineering and educational countermeasures.



Description of Problems	Magnitude of Problem	Possible Solutions	Current Level of Use Of Acceptance	Limitations in Applicability	Potential Effectiveness	Barriers to Implementation	Cost	Impact on Other Groups	Comment
Cross-section Design									
Difficulty of crossing wide arterial street, especially undivided arterials	Major	1. Install medians on all new suburban highways or 4 or more lanes.	Moderate	Virtually no limitations for new highways. However, some limitations are currently perceived.	High	Moderate	Moderate	Positive	Potentially the most effective solution to street crossing problems.
		2. Install European style refuge islands in strategic locations on existing undivided hwy.	Low	Must usually narrow lanes on existing hwy. to accommodate refuge islands. Must be well lighted.	High	Moderate	Low to moderate	Minimal impact	This solution is greatly under-utilized in US
		3. Design for reduced street width between signalized intersections (since capacity constraints are at signals).	Low	Could only be done where spacing between intersections is high.	Moderate	High	Low	Negative	Probably not feasible as a general practice.
		4. Introduce additional traffic signals to facilitate ped crossing.	Low	Could only be done in a few selected locations.	Moderate	High	Moderate	Highly negative	More feasible where ped crossings are concentrated at a point.
		5. Provide midblock actuated flashing ped signal.	Low	Should only be installed in key locations.	Moderate	Moderate	Low	Slightly negative	Designed to inform driver of presence of ped. Does not necessarily make crossing easier.
		6. Provide ped overpass.	Low	Only effective where at-grade crossing is blocked or is inconvenient.	Moderate - depends on no. of peds.	Moderate	High	Positive	Lack of use of facility continues to be a problem.
Difficulty of crossing highways with two-way left turn lanes	Moderate to major	1. Reduce use of this technique and provide medians to control access.	Low	Would need to design in frequent U-turn capability.	High	High	Moderate to high	Negative	Merchants and drivers will object heavily.
		2. Install refuge islands in spots where no turning is necessary.	Low	Must have at least some "dead spots" where turning would not generally occur.	High	Moderate	Low	Minimal impact	Islands must be well lighted and marked.

Table 4

Summary of Pedestrian Facility Problems and Possible Solutions



**Table 4**

Continued

<u>Description of Problems</u>	<u>Magnitude of Problem</u>	<u>Possible Solutions</u>	<u>Current Level of Use Of Acceptance</u>	<u>Limitations in Applicability</u>	<u>Potential Effectiveness</u>	<u>Barriers to Implementation</u>	<u>Cost</u>	<u>Impact on Other Groups</u>	<u>Comment</u>
No facilities provided for ped to walk along side of road	Major	<ol style="list-style-type: none"> 1. Require sidewalk/ pathway with all new hwy, construction. Paved or stabilized shoulder adequate in outlying areas. 2. Provide easier methods for obtaining easements, to address existing high-ways constrained by right-of-way. 	Moderate	Only allowed exclusion should be low volume residential streets.	High	Moderate	Moderate	Minimal impact	Could be required by FHWA for Federal projects.
Narrow bridges with no pedestrian accommodations	Moderate	<ol style="list-style-type: none"> 1. Design all new bridges with shoulder or raised walkway. 	Low	Probably would be viewed as giving excess authority to public agencies.	High	High	Low	Negative	Would put property owners at a disadvantage.
Excessive traffic speeds in residential or commercial areas	Moderate to major	<ol style="list-style-type: none"> 1. Design low-cost walkway system for attaching to outside of bridge. 2. Design curvature and circuitry into road system. Keep streets narrow. 	Moderate	None	Moderate to high	Moderate	Moderate to high	Positive	
		<ol style="list-style-type: none"> 1. Design curvature and circuitry into road system. Keep streets narrow. 2. Increased enforcement. 3. Provide speed control devices (e.g., speed bumps, traffic circles, intersection flares, etc.) 	Low	Feasibility and design dependent on structural nature of existing bridge.	Moderate to high	Moderate	Moderate	Positive	
		<ol style="list-style-type: none"> 1. Design curvature and circuitry into road system. Keep streets narrow. 2. Increased enforcement. 3. Provide speed control devices (e.g., speed bumps, traffic circles, intersection flares, etc.) 	Moderate	Limited mostly to local and collector streets. Not appropriate on major highways.	High	Moderate	Moderate	Slightly Negative	Can create some waste or inefficiency in lot layout.
		<ol style="list-style-type: none"> 1. Design curvature and circuitry into road system. Keep streets narrow. 2. Increased enforcement. 3. Provide speed control devices (e.g., speed bumps, traffic circles, intersection flares, etc.) 	Moderate	Cost is primary limitation.	Moderate	Moderate to high	High	Negative	Better to control speed through geometric design.
		<ol style="list-style-type: none"> 1. Design curvature and circuitry into road system. Keep streets narrow. 2. Increased enforcement. 3. Provide speed control devices (e.g., speed bumps, traffic circles, intersection flares, etc.) 	Low	Primarily used in residential areas. Not appropriate for major highways.	High	High	Low to moderate	Negative	Devices have been controversial and not yet widely accepted.

Table 4

Continued

Description of Problems	Magnitude of Problem	Current Level of Use Or Acceptance		Limitations in Applicability	Potential Effectiveness	Barriers to Implementation	Cost	Impact on Other Groups	Comment
		Possible Solutions							
Safety/convenience of walking in commercial area with many poorly channelized driveways	Moderate to major	1. Consolidate driveway entrances. Requires local regulation.	Low	Feasible in some newly developing strips. Generally infeasible in existing strips.	High	High	Moderate in new strips	Both positive and negative impacts	
		2. Provide service road in newly developing areas.	Low	Must have ample right-of-way.	Low to moderate	High	High	Both positive and negative impacts	Greatly amplifies problems at intersections.
		3. Improve driveway channelization. Would require local mandate.	Moderate	Particularly needed where parking areas open directly to street.	Moderate to high	High	Moderate	Positive	Public participation in financing would usually be needed.
Difficult and hazardous pedestrian movement through interchange area	Major	1. Provide sidewalk and markings on all new interchanges accessible to peds.	Moderate	Applies only to facilities not excluding ped traffic.	High	Moderate	Moderate	Positive	Should become routine practice, required in state/local guidelines.
		2. Provide barrier between traffic lanes and ped walkways.	Low	Not necessary for low speed facilities.	Moderate	High	Moderate	Minimal impact	Provides additional measure of safety for pedestrians.
		3. For existing interchanges w/o sidewalk or shoulders, consider routing peds onto median.	Low	Primarily applicable to full or partial cloverleaf interchanges.	Moderate	Moderate	Low	Low	Removes peds from hazardous ramp crossings.
Missing sidewalk links	Major	1. Perform sidewalk inventory, priority improvement program, and master plan of walkways.	Moderate	None	High	Low	Low	Minimal impact	Must be followed with funding and construction.
		2. Provide public funds for sidewalk construction with provision for recovering costs from land owner when development occurs.	Low	Legal mechanism must be provided to cover costs.	High	Medium	Low	Minimal impact	Allows sidewalk to be completed even if area is only partially developed.
		3. Obtain easements or take part of roadway lane to fill in missing links where barriers exist (e.g., retaining walls).	Low	Will be unusual to be able to take part of roadway lane.	Moderate	High	Moderate	Slightly negative	Practical only for limited set of conditions.



Table 4

Continued



<u>Description of Problems</u>	<u>Magnitude of Problem</u>	<u>Possible Solutions</u>	<u>Current Level of Use Of Acceptance</u>	<u>Limitations in Applicability</u>	<u>Potential Effectiveness</u>	<u>Barriers to Implementation</u>	<u>Cost</u>	<u>Impact on Other Groups</u>	<u>Comment</u>
Obstructions in sidewalk	Moderate	1. Provide local guidelines limiting location of ob-stacles. 2. Obtain easements, where necessary, to locate objects out of ped path.	Low	None	Moderate	Moderate	Low to moderate	Minimal impact	Can easily be provided in local ordinances. Alternate locations not always possible.
Security problem on certain isolated pedestrian pathways	Major	1. Refrain from constructing pathways in secluded areas. Provide paths primarily along street frontages. 2. Provide clear view of pathways from residences and/or street. 3. Provide more lighting, telephones, patrols or alarm systems.	Moderate	Residents must be willing to accept pathways in front of homes. Difficult to maintain visibility on many recreational pathways.	High	Moderate	Low	Minimal impact	Easement process time-consuming and sometimes costly. Rear yard walkways known to have security problems in some areas.
Signalization									
No accommodation for peds at some suburban signals, but ped volumes are low	Moderate to major	1. Provide ped actuated signal regardless of ped volume. 2. Inform ped that full crossing time may not be available in one phase.	Moderate	Only needed where min. crossing time not provided each cycle.	High	Moderate	Moderate to high	Slightly negative	Residents can perceive visibility as invasion of privacy.
Minimum ped clearance time inadequate to accommodate slow walking peds	Moderate to major	1. Lengthen ped clearance times where proportion of slower peds is higher than normal. Take time from WALK phase if WALK longer than minimum.	Low	Needed primarily near elderly housing, school, etc.	Moderate to high	Low	Low	Minimal impact	Security problem will still be perceived.
									Security problem will still be perceived.
									Represents the classic dilemma in facilitating ped. vs. vehicular flow.
									If adequate full crossing time not provided, ped should be informed of this.
									Impact depends on nature of traffic congestion.

Table 4
Continued

Description of Problems	Magnitude of Problem	Possible Solutions	Current Level of Use Of Acceptance		Limitations in Applicability	Potential Effectiveness	Barriers to Implementation	Cost	Impact on Other Groups	Comment
Pedestrians frequently do not obey signal indications	Moderate	1. Upgrade ped enforcement effort.	Low		If done, should be selective enforcement.	Low	High	High	Slightly positive	Although lack of compliance is rampant, impacts are not necessarily negative.
Lack of or improper application of crosswalk markings	Moderate	1. Develop and implement reasonable crosswalk application guidelines.	Moderate		None, but acceptable guidelines need to be developed.	High	Moderate	Low	Positive	
		2. Develop symbol to identify preferred crossing location without marking crosswalk.	Low (some in Europe)		Needs to be more fully tested before widespread application.	Moderate	Moderate to high	Low	Uncertain	Primary purpose is to reduce false sense of security.
Open parking areas, not enforcing disciplined traffic flow and making pedestrian crossings hazardous	Moderate to high	1. For new parking lots, enact local parking lot landscaping standards, emphasizing landscaped islands.	Moderate		None	High	Moderate	Moderate	Positive	
		2. For existing parking lots, islands sufficient to discipline traffic flow.	Low		Parking lot must have ample spaces to accommodate users.	High	Moderate	Moderate	Positive	Owners often more concerned about having adequate space than having landscaping.
Overpass or underpass underutilized because at-grade route more convenient	High	1. Install barrier in median.	Low		Must have median available and no nearby intersections.	High	Moderate	Moderate	Minimal impact	Limits accessibility but increases safety.
		2. Design over/under pass to minimize travel path (e.g., provide stairs in addition to ramps and grade approaches).	Low		Topography must be conducive.	High	Low	Moderate to high	Minimal impact	Handicapped requirements sometimes counterproductive in accessibility for others.
Inadequate street lighting at pedestrian crossing points	Moderate to high	1. Provide traditional street lighting.	Moderate		None	Moderate	Moderate	High	Positive	Should be more intense at intersections and key crossing points.
		2. Provide special pedestrian-oriented lighting.	Low		Provide only at primary crossing points with heavier ped volumes.	High	Moderate	Moderate	Positive	Contrast to normal lighting provides greater conspicuity at key points.





Table 4
Continued

Description of Problems	Magnitude of Problem	Possible Solutions	Current Level of Use Of Acceptance	Limitations in Applicability	Potential Effectiveness	Barriers to Implementation	Cost	Impact on Other Groups	Comment
Institutional and Legal Problems									
General lack of respect for pedestrians by drivers	Major	1. Selective enforcement (preceded by publicity) of ped right-of-way.	Low	Should focus on situations where driver yielding is a problem.	High	High	High	Perceived negative	Affect on accident rates is uncertain.
		2. Increase fines for violations of ped right-of-way.	Low	None	Moderate	Moderate	Low	Perceived negative	Needs to be backed by increased enforcement.
Lack of coordination and continuity in pedestrian facilities	Major	1. Make master planning for pedestrian facilities mandatory in state law.	Moderate	None	High	Moderate	Low	Positive	Only way to ensure ped planning takes place is to require it by law.
		2. Increase public investment in completing sidewalks and pathways.	Moderate	None	High	Moderate to high	High	Positive	Consider specifying minimum funding levels by law.
Lack of communication in development process	Major	1. Develop more rigorous administrative procedures to force communication.	Moderate	None	Moderate	High	Low	Positive	Cannot make administration so elaborate that it slows down the development process.
		2. Designate person in public agency as the pedestrian advocate.	Low to moderate	None	High	Moderate	Low	Positive	One of the most effective low cost actions.
Lack of vocal, organized advocacy group addressing ped needs	Major	1. Establish citizen task force on pedestrian needs.	Low	None	High	Moderate	Low	Positive	Relies on citizens taking an interest.
		2. Establish pedestrian facility "hotline."	Low	None	Moderate	Moderate	Low	Positive	Provides recognized avenue for input.

Table 4

Continued

<u>Description of Problems</u>	<u>Magnitude of Problem</u>	<u>Possible Solutions</u>	<u>Current Level of Use Of Acceptance</u>	<u>Limitations in Applicability</u>	<u>Potential Effectiveness</u>	<u>Barriers to Implementation</u>	<u>Cost</u>	<u>Impact on Other Groups</u>	<u>Comment</u>
Inflexibility in zoning and subdivision regulations	Major	1. Build in flexibility to regulations (e.g., performance zoning).	Moderate	Usually depends on local perspective on development.	High	High	Low	Depends on situation	Offers greater potential benefit but also greater risk.
		2. Provide special zones of development for pedestrian orientation.	Low to moderate	Subject to local and state law.	High	Moderate	Low	Positive	Special ped-oriented design guidelines would be provided.
Suburban land use patterns discourage pedestrian travel	Major	1. Provide incentives for mixed-use and development clustering.	Low to moderate	Some areas not physically or politically suited to ped-oriented development.	Moderate	Low	Low	Possibly negative	Higher density development needed for ped-orientation. Sometimes opposed by community.
		2. Employ "urban village" concept.	Moderate	Must be planned under right physical conditions.	High	Moderate	Low	Positive	Applicable to original development or redevelopment.
		1. Provide for minimum F.A.R.s as well as maximum.	Low	Only in areas planned for higher density development.	Low	High	Low	Possibly negative	Developers usually incentive toward higher F.A.R.s anyway.

Source: Planning and Implementing Pedestrian Facilities in Suburban and Developing Rural Areas, Transportation Research Board, 1987.

Figure 4

Matrix - Pedestrian
accident types and
potential engineering
countermeasures

Source: Florida Pedestrian Safety Plan, FDOT, 1992

Countermeasures Accident Type	Engineering and Physical															
	Barrier: Median	Barrier: Roadway/Sidewalk	Barrier: Street Closure	Bus Stop: Relocation	Crosswalk: Intersection	Crosswalk: Midblock	Diagonal Parking - 1 Way Street	Grade Separation	Facilities for Handicapped	Lighting: Crosswalk	Lighting: Street	One-Way Streets	Retroreflective Materials	Safety Islands	Sidewalk/Pathway	Signal: Ped. (Shared)
Dart-out (First Half)	•	•				•	•									
Dart-Out (Second Half)	•	•				•	•					•		•		
Midblock Dash	•	•				•								•		
Intersection Dash					•			•		•	•			•		
Turn-Merge Conflict								•								
Turning Vehicle								•								
Multiple Threat								•		•	•				•	
Bus Stop Related				•												
School Bus Stop Related				•												
Ice Cream Vendor																
Trapped					•			•						•	•	•
Backup																
Walking on Roadway		•									•		•	•		
Result Vehicle-Vehicle Crash																
Hitchhiking											•		•			
Working in Roadway																
Disabled Vehicle Related																
Nighttime Situation										•	•		•			
Handicapped Pedestrians									•							

* Dots designate countermeasures believed to positively affect behavior/accident types.

Figure 5

Matrix - Pedestrian
accident types and
potential educational
countermeasures

Source: Florida Pedestrian Safety Plan, FDOT, 1992

Countermeasures Accident Type	Pre-School			Elementary School						High School	General Public				Elderly	
	Parental Guidance	Traffic Safety Clubs	Television Programs	Walking in Traffic Safety	Watchful Willie	Officer Friendly	Demonstrations by Patrols	Education Within the Curriculum	Green Pennant Program	"Big Wheel" Spot	Willy Whistle Program	Child Intersection Dash Spot	"And Keep on Looking"	Assemblies	Drivers Education	Your Traffic Court
Dart-out (First Half)					•						•					
Dart-Out (Second Half)					•						•					
Midblock Dash																
Intersection Dash												•	•			
Turn-Merge Conflict																
Turning Vehicle																
Multiple Threat																
Bus Stop Related						•										
School Bus Stop Related						•										
Ice Cream Vendor																
Trapped																
Backup	•															
Walking on Roadway																
Result Vehicle-Vehicle Crash																
Hitchhiking																
Working in Roadway																
Disabled Vehicle Related																
Nighttime Situation																
Handicapped Pedestrians																
Pedestrian Safety in General	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

* Dots designate countermeasures believed to positively affect behavior/accident types.



a. General Principles for Provision of Pedestrian Facilities

General principles for provision of pedestrian facilities that require consideration include the following:

- All roadways should have some type of walking facility out of the traveled way. A separate walkway is often preferable, but a roadway shoulder will also provide a safer pedestrian accommodation than walking on the road.
- Direct pedestrian connections should be provided between residences and activity areas. It is usually not difficult to ascertain where connections between residential areas and activity centers will be required during the early stages of development.
- Many of the benefits of sidewalks are not quantifiable, with the actual magnitude of the safety benefit unknown. This is partially because individuals tend to walk where there are sidewalks and sidewalks tend to be built where people walk. Sidewalk installation warrants based on pedestrian volume are, therefore, not practical. In addition, pedestrian volumes are not regularly collected by most agencies and cannot be easily forecast. Development density can be used as a surrogate for pedestrian usage in determining the need for sidewalks.
- The need for sidewalks can be related to the type, density and pattern of land uses in an area. Local residential streets, especially cul-de-sacs, can accommodate extensive pedestrian activity on the street because there is little vehicular activity. Minor collector streets, if they do not connect important origins, such as a residential cluster, with important destinations, such as a local shopping area, library or park, may have less pedestrian activity than the local street or cul-de-sac. However, if such collectors do perform an important linking function between land uses, then they may have more pedestrian usage than local roads and will require continuous sidewalks along both sides of the street. Collector streets are normally used by pedestrians to access bus stops and commercial developments on the arterial to which they feed. Sidewalks should be provided on all streets within a 0.4 kilometers (1/4 mile) of a transit station. Sidewalks should also be provided along developed frontages of arterial streets in zones of commercial activity.
- Collector and arterial streets in the vicinity of schools should be provided with sidewalks to increase school trip safety.

b. Factors in Identifying Need

Variations in development density, spatial distribution of activity centers, the lack of and problems with forecasting pedestrian volumes and the absence of quantified safety benefits combine to make establishing a strict set of sidewalk installation warrants difficult. The result is that decisions on proper pedestrian facilities are often dependent upon the knowledge, imagination and experience of the planners and engineers involved.

Specific warrants based on pedestrian volumes are not established for sidewalks. Actual counts may not reflect the demand for pedestrian facilities because existing conditions may be so inadequate as to discourage pedestrian use and because weather conditions, school schedules, holidays and similar factors may cause significant fluctuations in daily pedestrian usage.

In general, sidewalks are considered warranted whenever the roadside and land development conditions are such that pedestrians regularly move or will move along the highway. Sidewalks should be constructed along any street or highway in developed areas having an AADT greater than 1200 and not provided with shoulders, even though pedestrian traffic may be light.

At a minimum, 1.5 meter (5 foot) sidewalks should be included on both sides of all roadways in Centers, as defined in the New Jersey State Planning Commission's State Development and Redevelopment Plan (SDRP), except limited access highways, unless unique land use patterns assure that no pedestrians will walk on one side. This dimension allows two adults to walk comfortably side-by-side or pass each other. Outside of Centers, 1.2 meter (4 foot) sidewalks provide an acceptable width for lightly used sidewalks and have traditionally been used as the minimum requirement in subdivision ordinances. Every effort should be made to add sidewalks to all existing streets in Cen-



ters where they do not exist, and to complete missing links. The priority for completing these links should go to areas serving schools, parks, transit stations and bus stops, libraries, military bases, recreation centers, tourist zones, and where high levels of elderly pedestrians can be anticipated.

Sidewalks should be included in all residential and commercial development plans submitted to public agencies in Centers, and in almost all development plans in Planning Areas 1 and 2.

c. Policies to Support Sidewalk Installation

The State Planning Commission's Report on Implementation Issues recommends that all long range and comprehensive plans include a pedestrian circulation element. Circulation should be planned to connect sidewalks and other pedestrian facilities with neighborhood shopping, recreational and public transit facilities. A plan to provide sidewalks on at least one side of all future neighborhood streets is required.

All MPO's should submit a ten year plan to provide sidewalks on both sides of all collector and arterial roads within the urbanized area.

To make up for the deficit of sidewalks on State system roadways, the following actions are highly encouraged for all designers or project managers:

- Extend project boundaries to include sidewalks for 1.6 to 3.2 kilometers (1 to 2 miles) on either end of a roadway improvement project to provide continuity to pedestrian travel. Sidewalks should continue to common destinations and reasonable terminal points.
- Work with community officials to add sidewalks to streets adjacent or parallel to arterial roads. This provides pedestrians with trip continuity and an alternative to busy arterials. This can help relieve congestion on the arterial.
- Whenever possible NJDOT should group a number of sidewalk improvements as a single independent sidewalk improvement project.

d. Policy Framework for the Provision of Sidewalks by the State

The 1992 SDRP seeks to change future development patterns by creating new compact, mixed-use settlement patterns in Centers of various kinds and encouraging the growth or redevelopment of existing Centers. This relates to and fulfills numerous other goals in the Plan, such as reducing sprawl and its associated consumption of rural land and character, maximizing the use of existing and contiguous infrastructure, increasing the potential for transit use, reducing excess infrastructure costs and revitalizing existing communities. This overall goal is captured in the Plan's title - "Communities of Place" - where the Centers become the pleasant and desirable focus of community activity and their core areas are the domain of the pedestrian:

"In all cases the center core should be designed at a human scale. It should be a pedestrian-oriented area, with suitable amenities and infrastructure systems that encourage interaction within the community. The center core should group activities within walking distance, typically not more than one-half mile from origin to destination. Pedestrian routes should be safe, using sidewalks, walkways and paths that minimize conflict with vehicle and bicycle traffic. Architectural design guidelines, such as short to moderate building setbacks and the provision of street landscaping and furniture, are important for the physical elements that create a "sense of place." Coordination with school district master planning is also necessary, as schools can serve, and have often traditionally served, as focal points for educational, social, recreational, health care, and other activities within their communities."

The Plan calls for coordinating job growth areas with new housing areas so as to reduce lengthy solo auto trips and their associated pollution and to encourage a greater amount of walking trips. The Federal Clean Air Act Amendments identify New Jersey as a "non-attainment" state with 18 of its 21 counties identified as "severe" ozone areas; this further highlights the need for and importance of pedestrian planning. Concurrently, the Federal Intermodal Surface Transportation and Efficiency Act (ISTEA) legislation both points to and provides funding support for "enhancements" of the traditional, auto-oriented practices of transportation planning. These enhancements include pedestrian facilities for all trip purposes.

The SDRP requires coordination and consistency between the planning policies and actions of all State agencies. Since land use planning, transportation plans and pedestrian activ-



ity are all so interrelated, it is particularly important to relate the SDRP concepts to these Pedestrian Design Guidelines. Thus throughout the Guidelines, there are references to Centers and Planning Areas. (These terms are defined and discussed at length in the SDRP.)

In Table 5, SDRP's land use classification of Centers and Planning Areas is arrayed against different classes of State roads. The character of the roadways in these various settings and their potential for pedestrian use are related to State responsibilities for sidewalks. This table is designed as a guide only, since situations will occur that will elicit different responses than those indicated. Note that where sidewalks are not to be provided but where pedestrian movement may still occur on State roads, these Guidelines recommend provision of shoulders to accommodate this need.

	Composite Functional Classifications System for State Rural & Urban Roads				
	Interstate/Freeway ²	Principal Arterial	Minor Arterial	Major Collector	Minor Collector/ Local Street
Centers ¹					
Urban Centers					
Core	☐	●	●	●	●
Dev. Area	☐	●	●	●	●
Town Centers					
Core	☐	●	●	●	●
Dev. Area	☐	☐	●	●	●
Regional Centers (new & existing)					
Core	☐	●	●	●	●
Dev. Area	☐	☐	●	●	●
Villages					
Core	○ ³	●	●	●	●
Dev. Area	☐	☐	☐	○	○
Hamlets	○ ³	☐	●	☐	○
Planning Areas					
Metro (PA1)	☐	●	●	●	●
Subrbn (PA2)	☐	●	●	●	●
Fringe (PA3)	○	☐	☐	☐	☐
Rural (PA4) ⁴	○	○	○	○	○
Env. (PA5)	○	○	○	○	○

- Sidewalks required.
- ☐ Sidewalk optional.
- Sidewalk not required.

¹Planning Areas consist of Centers and Environs. Criteria for designating the Centers is described in the SDRP, p93-100. Centers contain a Core, the densest "downtown" type area and a surrounding Development Area which is bounded by a Community Development Boundary. Outside this Boundary are the "environs" which are designated for less intensive development. Various Centers can occur in the different Planning Areas. Where this happens, the guide for sidewalk provisions in the Center takes precedence over the Planning Area guide.

²Sidewalk provisions for Interstate/Freeway classification column refer to cases where the pedestrian grid in urban areas is disrupted by the roadway, not necessarily areas along or parallel to the roadway itself.

³Many freeways bypass Villages and Hamlets and therefore their sidewalk provisions will be consistent with the Planning Area guidelines.

⁴On rural highways the use of curbs is not recommended and pedestrian walkways are provided along shoulders or in the roadside area. In Centers in Rural Planning Areas, however, curbs may be appropriate.

Table 5:

Guide for Sidewalks
in relation to the SDRP



5. Integrating Pedestrian Facilities into the Municipal and County Planning Process

a. Overall Planning Process

Many of the problems pedestrians confront can be alleviated by planning pedestrian facilities within the framework of the overall planning process. Pedestrian considerations are often not given the priority they deserve since they must compete with many other factors involved with the design and financial aspects of the development process. Pedestrian facilities, however, not only improve pedestrian circulation but can enhance the marketability of a development. This is especially true if the pedestrian network is part of a landscaping plan. In suburban downtown areas or main street areas of small towns, the addition of pedestrian improvements and amenities can help counter the flight of retail activity to outlying malls. The following is a summary of actions which can be taken by local and State planning agencies to adequately provide for pedestrian facilities.

- Policy statements should be included in the State, regional, county and local master plans that relate to pedestrian needs and objectives.

While these statements do not necessarily guarantee the provision of pedestrian facilities, they at least indicate a recognition of the need. This increases the likelihood that further steps will be taken toward the planning and implementation of pedestrian facilities.

- The community master plan should include specific recommendations on pedestrian facilities.

Systems of walkways and trails can be a combination of recreational and utilitarian paths, including conventional sidewalks, that comprise the pedestrian network. These facilities should be formally indicated on a map with consideration to topography and the probable location of roadways as part of the circulation plan element of the master plan as described in the Municipal Land Use Law, N.J.S.A. 40:55D-28.b(4).

- State and local ordinances, standards, warrants and specifications should clearly state the guidelines for sidewalk installation, including funding responsibility.

These documents typically govern the design of transportation facilities and, thereby, govern the extent to which pedestrian considerations are implemented. Subdivision regulations have the greatest impact on the location and design of sidewalks and walkways. These regulations encourage the developer to provide pedestrian related design amenities.

- A checklist should be developed to assist both the developer and reviewer in identifying items that should be considered in the planning of pedestrian facilities.

The checklist should remind a developer of the need to include basic pedestrian facilities and the design principles that should be employed. A sample checklist is presented in Figure 6. This checklist should be modified to include items that are of regional concern. For example, if bicycle facilities are of concern, then checklist items pertaining to bicycle facility design principles should be included.

b. Modifications to Local Plans and Ordinances that will Enhance Pedestrian Movement

This section illustrates how typical municipal land development ordinances may be modified to encourage pedestrian-friendly land development practices and to require provision of appropriate pedestrian amenities. Appropriate techniques are presented for each of the Planning Areas identified in the SDRP.

Metropolitan and Suburban Planning Areas (PA1 and PA2)

- Create options in the zoning ordinance for mixed use developments or Suburban Activity Centers with appropriate performance measures to cover the mix of land uses, transit relationships and pedestrian-oriented site planning.
- At a smaller scale, typically modules of 40-60 hectares (100-150 acres), provide the option in zoning ordinances for Traditional Neighborhood Design (TND) or neo-traditional site planning. The ordinance should require appropriate mixes of land uses and establish pedestrian-friendly streetscapes and road standards. Additional discussion of TND concepts is provided in Chapter Three.



- Allow small scale/retail/convenience services to locate within large employment concentrations to allow workers to walk for lunchtime, service and personal business trips.
- Modify typical highway commercial zones to allow transit friendly uses as permitted uses. Such uses include hotels, movie theaters, shopping centers, department and convenience stores, beauty and personal services, gyms, medium to high density residential development, 10 units per hectare (4 units per acre), cultural facilities, day care centers, middle/high schools and colleges, religious facilities, government agencies, correctional facilities, offices and financial institutions, medical facilities, employment parks and medium to high density manufacturing employment.
- Provide FAR incentives for appropriate types of pedestrian amenities (this can apply both in urban and suburban situations).
- Where reduced parking standards in commercial areas (for example, adjacent to transit systems) allow for additional retail square meters (square footage), require a pedestrian-friendly retrofit as a condition of granting additional square meters (square footage).
- Allow for PUDs; ensure that PUD ordinance language requires the construction of sidewalks on streets in addition to pathway systems through open space. Experience and research has shown that such pathways are frequently underused or perceived as unsafe unless they directly connect to attractive destinations. They cannot replace the need for sidewalks.
- In Centers, provide incentives for architectural design treatments which offer pedestrians protection from the elements, such as canopies or arcades.

Site Review Checklist for Pedestrian Facilities

Overall Pedestrian System:

- Are both utilitarian and recreational walking considered in the plan?
- Are utilitarian paths direct? Do they provide for connections to existing pedestrian magnets nearby?
- Do recreational pathways take advantage of unique site features? Are they generally visible from homes or other buildings?
- Does the pedestrian system consider the type and probable location of future development on adjacent or nearby parcels of land? Is there flexibility to provide direct connections to adjacent parcels, should that be desired later on?
- Are pedestrian entrances clearly evident through either design features, topography, signing or marking?
- Are walkways along the street separated and buffered from traffic as much as possible?

Safety and Security:

- Are crossings of wide expanses of parking lot held to a minimum?
- Are pathways generally visible from nearby buildings and free from dark, narrow passageways?
- Is adequate lighting provided for nighttime security?
- Are sight distances adequate for motorists to see pedestrians at intersections and other places where people are likely to enter the roadway?
- Do pathways lead to the safest crossing points?
- Are pedestrian/vehicle conflict points kept to a minimum?
- Are pedestrians clearly visible to traffic wherever they cross the street?

Walking Surfaces and Amenities:

- Are the walking areas scaled to the pedestrian?
- Are the walking surfaces skid-resistant and sloped for drainage?
- Are provisions made for curb ramps and are they properly designed?
- Are major changes in grade properly treated with stairways and handrails?

Source: *Planning, Design and Maintenance of Pedestrian Facilities*, FHWA, 1989.

Figure 6

Site Review Checklist for Pedestrian Facilities



Suburban and Fringe Planning Areas*

- Consider modifications to road standards and subdivision regulations in the direction of current performance standards that are more tuned to functional classification.
- Sidewalk widths in suburban areas having a gross density greater than ten units per hectare (four units per acre) or where pedestrian volumes are high should be a minimum of 1.5 meters (5 feet) wide, rather than 1.2 meters (4 feet). Several studies support this dimension, which allows two people to walk comfortably side-by-side, rather than the more typical 1.2 meter (4 feet) standard which is too narrow. Where 1.2 meter (4 feet) sidewalks are allowed, ensure that 1.5 meter (5 feet) wide passing areas for wheelchairs are available every 60 meters (200 feet).
- Advocate separation of pedestrian sidewalks in suburban settings from the roadway by a grass strip of at least 0.9 meters (3 feet) wide.
- Dimensions for downtown area urban sidewalks should require a 1.2 meter (4 foot) zone for trees and street furniture and a 0.4 meter (1.5 foot) zone alongside the building facades, both of which are not part of the effective width of the sidewalk circulation area. Using a minimum effective sidewalk width of 2.2 meters (7.5 feet), this yields a total of 3.9 meters (13 feet) minimum. Where heavier use is anticipated, 5.4 meters (18 feet) is an appropriate minimum dimension. These urban settings generally apply in situations above 1500 pedestrians at the peak hour.
- Require construction of sidewalks or walkways along all arterial and collector roads located within 2.4 kilometers (1.5 miles) of a school.
- Require developers to extend sidewalks up to 120 meters (400 feet) beyond the boundary of the site to provide for sidewalk continuity.
- Municipal Master Plans should incorporate a pedestrian network or system as part of the circulation element of the master plan. Such an element should address both functional walking trips as well as recreational trips. Minimum components of the pedestrian element should be specified (e.g. inventory of current facilities, gaps in the system, any relationships or conflicts between bicycle and pedestrian use of facilities, areas of special focus such as mixed-use downtowns or transit centers, potential for enhancements, identification of high accident locations and incidents of pedestrian/vehicle conflict, etc.)
- Municipal Master Plan elements should include provisions that define and encourage linking of residential development and commercial areas by bicycle and pedestrian paths, even where roadway linkages are not present. These provisions may include “cut-throughs” between cul-de-sacs and retrofitting existing developments, as discussed further and illustrated in Chapter Three.
- State discretionary funds which are to be used through the SDRP or MPO as incentives to encourage local municipalities to develop appropriate plans, could specifically reference that NJDOT will allocate discretionary funds for sidewalks, landscaping, and other enhancements over and above the “minimum” only where municipalities have adopted community-wide pedestrian plans.

*** Note:** These techniques are applicable statewide, and need not be limited to the Suburban and Fringe Planning Areas.

